

METHOD AND APPARATUS FOR SAMPLING LIQUID

This invention relates to a method and to apparatus for sampling liquid. It is particularly concerned with the sampling of waste waters so as to obtain a representative portion of liquid from which its average composition can be determined.

When sampling a flowing liquid, such as waste waters from a drain, a common requirement is to establish its average composition over a specific period (such as twenty four hours). This is normally achieved by aggregating a set of individual sub-samples taken with sufficient frequency to include all the effect of changes in composition of the flow over the period of the sample. Individual sub-samples can either be aggregated in a single container to provide a bulk sample giving a gross average or alternatively each sub-sample can be passed into a separate container in a sequence of such to store samples of the flow from hour to hour.

The more frequent the taking of the samples the more representative the eventual aggregated sample will be. The frequency of sampling may be at regular time intervals or at time intervals whose length are in inverse proportion to a rate of flow of the sampled liquid (such sampling is termed 'flow proportional sampling').

When sampling waste waters it is important to include solid wastes carried by the waters so that the, or each, sample is representative of the material flowing or conveyed at the time of sampling. Consequently an effective sampling system needs to be able to provide for the passage of solid waste components into a sample container.

According to a first aspect of the present invention there is provided a method of liquid sampling by way of a self contained unit comprising the steps of:

- 1 periodically coupling a pressurisable sample chamber to a source of sub-atmospheric pressure to cause a bulk sample of liquid for sampling to be drawn into the chamber from a body of liquid by way of a first passage;
- 2 retaining a sample volume thereof in the chamber while allowing surplus liquid from the bulk sample to drain from the chamber by way of the first passage; and
- 3 allowing the retained sample volume to pass out of the chamber by way of a second passage under the control of a delivery valve characterised in that: the method of periodically coupling the sample chamber to the source of sub-atmospheric pressure is undertaken by way of a valve system comprising first and second flexible tubes, the first flexible tube linking a source of air at atmospheric pressure to the chamber and the second tube linking the source of air at sub-atmospheric pressure to the chamber: and a first clamping device in the form of a first cam which can, depending on the disposition of the first cam, alternately:
 - i) distort the first tube to prevent the chamber communicating with the sub-atmospheric source while allowing the chamber to communicate with the atmospheric source by way of the second tube;
 - ii) distort the first tube to prevent the chamber communicating with the atmospheric source while allowing the chamber to communicate with the sub-atmospheric source by way of the second tube.

According to a first preferred version of the first aspect of the present invention the step of allowing at least a part of sample volume hitherto retained in the sample chamber to pass out of the chamber by the second passage is characterised by the use of a flexible duct and is undertaken by way of a second clamping device operable between open and closed positions by way of a second cam so that:

- i) in the closed position the second clamping device distorts the outlet duct to prevent the passage of sample volume out of the chamber by way of the flexible duct; and
- ii) in the open position the second clamping device enables the passage of sample volume out of the chamber by way of the flexible duct.

Preferably the first and second clamping devices are powered by a common prime mover.

According to a second preferred version of the first aspect of the present invention or the first preferred version thereof the first clamping device is characterised by being in the form of a cam and an anvil, the cam being located eccentrically and rotatable relative to the anvil to leave a sequence of working clearances therebetween, each flexible duct being located in a working clearance.

According to a third preferred version of the first aspect of the present invention or any preceding preferred version thereof the second clamping device takes the form of a pivoted clamp having jaws acting on the outlet duct which jaws are displaceable between the open and closed positions by the second cam.

According to a fourth preferred version of the first aspect of the present invention or any preceding preferred version thereof the action of the prime mover on the second cam to close the outlet duct occurs before the combined actions of the same prime mover on the first cam to distort the first tube to prevent the chamber communicating with the atmospheric source while allowing the chamber to communicate with the sub-atmospheric source by way of the second tube.

According to a fifth preferred version of the first aspect of the present invention the method is characterised by the provision of a source of super-atmospheric pressure which can communicate with the pressurisable sample chamber by way of a third flexible tube; the cam of the first clamping device serving, at a particular disposition:

- i) to distort the first and second tubes to prevent the chamber communicating with the atmospheric and sub-atmospheric source while allowing the chamber to communicate with the super-atmospheric source by way of the third tube and similarly to claim 1;
- ii) to distort the first and third tubes to prevent the chamber communicating with the atmospheric and super-atmospheric source while allowing the chamber to communicate with the sub-atmospheric source by way of the second tube;
- iii) to distort the second and third tubes to prevent the chamber communicating with the sub-atmospheric and super-atmospheric source while allowing the chamber to communicate with the atmospheric source by way of the first tube.

According to a second aspect of the present invention there is provided apparatus for liquid sampling comprises a housing incorporating a pressurisable sample chamber and characterised by: